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Southwestern Region

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Forest Insect and Disease Conditions in the Southwestern Region, 1996

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Introduction

From mid-1995 through mid-1996, the Southwestern Region suffered one of the worst droughts recorded this century. In Arizona, this was the worst drought since 1904. In New Mexico, similar drought conditions had occurred during the turn of the century and the mid-1950's. Droughts like these can have a tremendous impact on forests and forest health. The occurrence of several large catastrophic wildfires throughout the Region was one of the more visible results of the drought, however there were other effects as well.

Drought symptoms usually appear first on shallow soils that hold little water. Among conifers, loss of older needles is a common response to moderate drought stress. With more severe stress, top and branch die back occur, and in very severe cases, whole trees can be affected. Trees rarely die outright from drought alone. In the trees that survive drought, the effects can persist after normal moisture resumes. For example, some conifers show reduced growth and needle length in the year following the end of a drought.

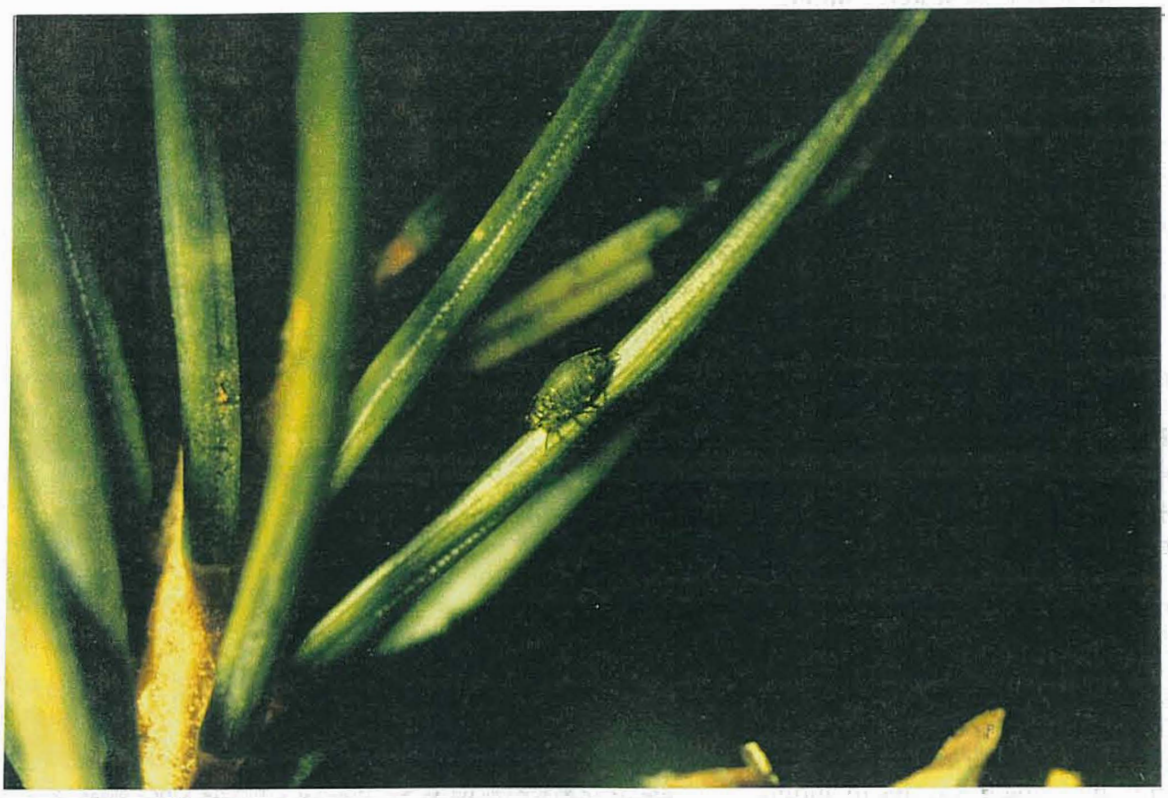
Hardwoods are similarly affected by drought stress. Evergreen oaks in central Arizona were particularly hard hit, in many cases dropping all of their leaves until the return of moisture during the summer rainy season.

In addition to direct effects of drought stress, there are indirect effects. By compromising host resistance mechanisms, drought stress commonly predisposes trees to attack by other agents, such as bark beetles. Bark beetle-caused mortality began appearing at lower elevations first. Ponderosa pine in the Prescott area and Fort Apache Indian Reservation (White Mountains), Arizona, were hard hit by a combination of bark beetle species including pine engraver beetles, western pine beetle and roundheaded pine beetle. Scattered mortality appeared elsewhere in the Region.

While droughts are a natural occurrence in the Southwest, their effects are no doubt more severe in a forest that has been changed by European settlement. The changes, marked mainly by increased tree densities and changes in species composition, result in forests which are more prone to catastrophic fire and larger bark beetle outbreaks during times of severe moisture stress. In 1996, these changes, combined with the drought, resulted in an unprecedented wildfire season and a substantial increase in bark beetle activity. Since bark beetle outbreaks and resulting tree mortality often lag behind the actual drought, we will probably see more beetle-caused mortality in 1997. While drought, fire, and bark beetles will always be important disturbance agents of southwest forest ecosystems, their adverse effects can be reduced by restoring forests to a more sustainable condition. Through the practices of thinning, and prescribed burning, the Region is making strides toward resolving this dilemma.

Spruce aphid defoliation on the Apache-Sitgreaves National Forests.

There are many ways that the Arizona and New Mexico staff groups are active in this arena. Through training, technical assistance, evaluations, and monitoring, we are available to assist federal land managers in making better land management decisions that incorporate the effects of forest insects and pathogens. In addition, we are actively involved in developing new technology that will help managers deal better with these issues in the future. This report summarizes the status of insects and diseases in the forests of the Southwest. Much of the insect information is based on aerial detection surveys. Most of the disease information is based on ground observations and surveys. The information on State and private lands was contributed by Bob Celaya, Forest Pest Specialist, Arizona State Land Department; and Bob Cain, Extension Forest Entomologist, New Mexico State University Cooperative Extension Service.



***Spruce Aphid,* Elatobium abietinum.**

Conditions in Brief

In the Southwest, bark beetle-killed trees increased from 39,375 acres in 1995 to 53,610 acres in 1996. Within the ponderosa pine forest cover type, tree mortality was caused by the roundheaded pine beetle (9,345 acres), *Ips* beetles (30,230 acres), western pine beetle (6,480 acres), and mountain pine beetle (3,295 acres). In the mixed conifer and spruce-fir forest cover types, mortality was caused by Douglas-fir beetle (830 acres), fir engraver beetle (2,825 acres), and spruce beetle (615 acres).

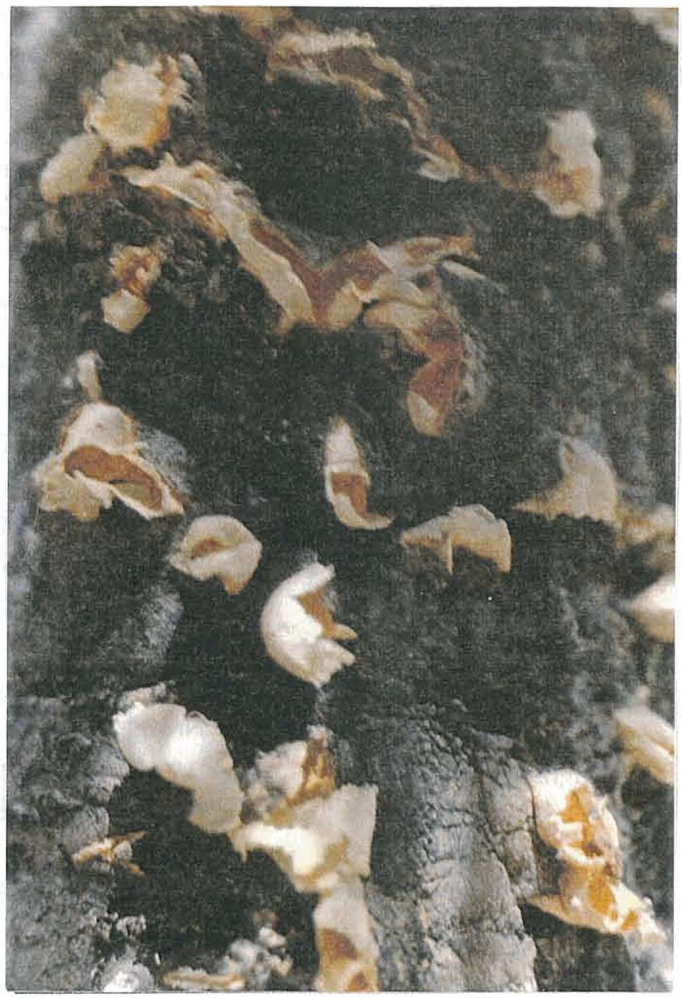
Insect defoliator activity Regionwide decreased from 205,095 acres in 1995 to 173,415 acres in 1996. The large majority of this defoliation was caused by the western spruce budworm (126,985 acres) and a complex of large aspen tortrix, western tent caterpillar, marssonina leaf blight, and abiotic factors (35,650 acres).

Newly reported this year is the spruce aphid, *Elatobium abietinum* (Walker). First detected in the southwest in 1988, it caused significant defoliation during the winter of 1995-1996. Approximately 10,780 acres of defoliation were detected during aerial surveys.

Dwarf mistletoes continued to be the primary cause of growth loss (other than dense stocking) in both mixed conifer and ponderosa pine cover types. They are estimated to cause an annual conifer volume loss of 25 million cubic feet. Both direct and indirect evidence suggests that the incidence and severity of these parasites has increased during this century.

The most common root rots in the Region are *Armillaria* spp. and *Heterobasidion annosum*. They are responsible for 5 million cubic feet of annual volume loss and create hazard trees in campgrounds and along roadways. Incidence in mixed conifer and spruce-fir cover types is higher than in the pine cover type. Similar to other indigenous diseases, root and butt rots can be beneficial to some wildlife species because they create snags and downed logs.

White pine blister rust occurs throughout most of the range of southwestern white pine on two Ranger Districts of the Lincoln National Forest and the Mescalero Apache Indian Reservation in New Mexico. It has not been detected elsewhere in the Region.



Close-up of white pine blister rust infection.

Table 1. Prominent 1995 Forest Insect and Disease Activity (acres) in Arizona and New Mexico by Land Ownership and Agent.

Damage Agent	State	National Forests	State & Private	Other Federal	Total
Roundheaded Pine Beetle	AZ	20	**	0	20
	NM	4,305	**	5,015	9,420
Ips Beetle	AZ	5,040	**	19,720	24,760
	NM	0	5,470	0	5,470
Douglas-fir Beetle	AZ	775	**	5	780
	NM	55	**	0	55
Mountain Pine Beetle	AZ	40	**	2,195	2,235
	NM	1,060	**	0	1,060
Spruce Beetle	AZ	275	**	0	275
	NM	295	**	45	340
Western Pine Beetle	AZ	1,650	**	70	1,720
	NM	4,755	**	0	4,755
Fir Engraver Beetle	AZ	2,180	**	210	2,390
	NM	300	**	375	675
Pinyon Pine Needle Scale	AZ	0	**	0	0
	NM	6,600	**	0	6,600
Ponderosa Pine Needle Miner	AZ	0	**	0	0
	NM	0	27,000	0	27,000
Western Spruce Budworm	AZ	425	0	2,645	3,070
	NM	84,330	39,305	280	123,915
Spruce Aphid	AZ	6,455	**	4,330	10,785
	NM	**	**	**	**
Ponderosa Pine Needle Cast	AZ	0		0	0
	NM	2,200	**	0	2,200
Aspen Defoliation	AZ	1,930	**	775	2,705
	NM	11,120	**	420	11,540
Root Diseases	AZ	219,000	**	**	219,000
	NM	860,000	**	**	860,000
Dwarf Mistletoes	AZ	1,040,000	674,000	25,000	1,739,000
	NM	1,114,000	348,000	581,000	2,069,000
Drought	AZ	33,240	**	27,890	61,130
	NM	**	**	**	**

***** = No data available.**

Status Of Insects

Douglas-fir Beetle

Dendroctonus pseudotsugae

Hosts: Douglas-fir

Douglas-fir beetle-caused tree mortality increased slightly Regionwide from 570 acres in 1995 to 835 acres in 1996. Mortality occurred in Arizona on the Apache-Sitgreaves National Forests (570 acres), Coconino National Forest (150 acres), Kaibab National Forest (55 acres), and the Fort Apache Indian Reservation (5 acres). Mortality on Federal lands in New Mexico included the Gila National Forest (25 acres) and the Santa Fe National Forest (30 acres).

Low levels of Douglas-fir beetle-caused tree mortality were also reported on State and private lands in Colfax County, New Mexico.

Ips Beetle

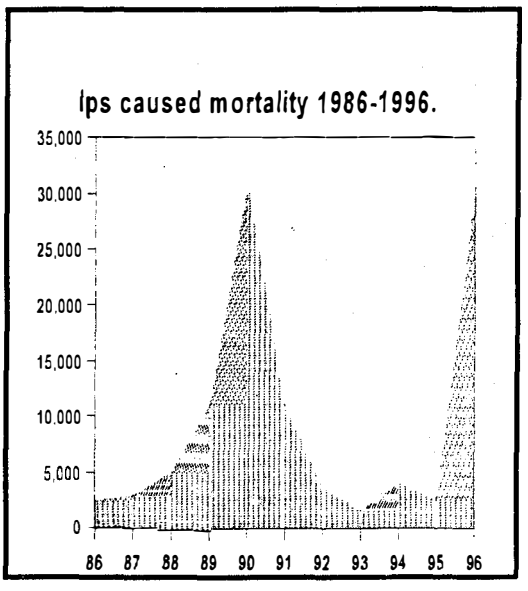
Ips spp.

Hosts: Ponderosa pine, Pinyon pine

Ips beetle-killed trees were detected on 30,230 acres in 1996 compared to 2,500 acres of the ponderosa pine forest cover type in 1995. In Arizona, mortality occurred on the Apache-Sitgreaves National Forests (100 acres), Coconino National Forest (475 acres), Coronado National Forest (170 acres), Kaibab National Forest (75 acres), Prescott National Forest (2,540 acres), Tonto National Forest (1,680 acres), San Carlos Indian Reservation (4,705 acres), and Fort Apache Indian Reservation (15,015 acres).

On State and private lands in New Mexico, *Ips* engraver beetles caused ponderosa pine and pinyon pine mortality on 5,480 acres. Damage was especially notable on the east side of the Sangre de Cristo mountains from Telecote to Mora, the east slope of Mt. Taylor east of Water Canyon, and in forest home construction areas in Los Alamos. *Ips* engraver beetle attacks also caused top-killing of large high value landscape ponderosa pine and southwestern white pine in the Ruidoso and Cloudcroft areas. In total, over 200 pockets of *Ips* engraver beetle-killed ponderosa pine were detected and these were often associated with dwarf mistletoe infection.

On State and private lands in Arizona, *Ips* beetle-caused mortality seemed to have increased throughout the state in both pinyon and ponderosa pines. The areas of greatest activity include: the communities of Walker, Groom Creek and Chaparral Heights, near Prescott; Red Lake, near Williams; Spring Valley, near Parks; Doney Park; Sedona and the Village of Oak Creek; the communities of Strawberry and Pine; Forest Lakes; Heber-Overgaard; Lakeside-Pinetop; Alpine; and Nutrioso.



Mountain Pine Beetle

Dendroctonus ponderosae

Hosts: Ponderosa pine

Tree mortality resulting from mountain pine beetle attacks increased from 570 acres in 1995 to 3,295 acres in 1996. Mountain pine beetle-killed trees were detected in Arizona on the Kaibab National Forest (40 acres) and Grand Canyon National Park (2,195 acres), and in New Mexico on the Carson National Forest (15 acres) and the Santa Fe National Forest (1,045 acres).

No new mountain pine beetle attacks were detected on State and private lands in previously infested areas of Moreno Valley and Vermejo Park, Colfax County, New Mexico.

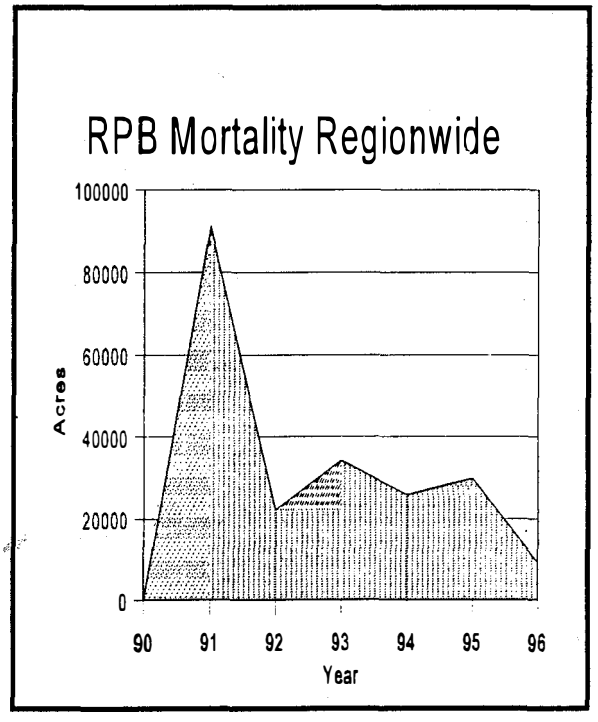
Roundheaded Pine Beetle

Dendroctonus adjunctus

Hosts: Ponderosa pine

Roundheaded pine beetle-caused tree mortality was detected on 9,340 acres of host type in 1996 compared to 29,900 acres in 1995. Mortality occurred in Arizona on the Coronado National Forest (20 acres), and in New Mexico on the Lincoln National Forest (4,305 acres) and the Mescalero Apache Indian Reservation (5,015 acres). This was a considerable decline in the Pinaleno Mountains, Arizona, and in the Sacramento Mountains of southern New Mexico, but the beetles remained active in ponderosa pine stands south of Mayhill and from Timberon to Sunspot, New Mexico.

Roundheaded pine beetle activity has increased on State and private lands in the Prescott area, Arizona, and the Ruidoso area, New Mexico.



Spruce Beetle

Dendroctonus rufipennis

Hosts: Spruce

Spruce beetle-caused tree mortality decreased from 1,240 acres in 1995 to 615 acres in 1996. Mortality was detected in Arizona on the Coconino National Forest (5 acres), Kaibab National Forest (270 acres), and in New Mexico on the Carson National Forest (80 acres), Gila National Forest (35 acres), Lincoln National Forest (35 acres), Santa Fe National Forest (145 acres) and the Mescalero Apache Indian Reservation (45 acres).

Western Pine Beetle

Dendroctonus brevicomis

Hosts: Ponderosa pine

Western pine beetle-killed trees increased from 1,910 acres of host type in 1995 to 6,480 acres in 1996. Mortality on Federal lands in Arizona included the Apache-Sitgreaves National Forests (1,510 acres), Coconino National Forest (20 acres), Kaibab National Forest (1,480 acres), Tonto National Forest (45 acres), and the Navajo Indian Reservation (70 acres), and in New Mexico on the Gila National Forest (4,755 acres).

Fir Engraver Beetle

Scolytus ventralis

Hosts: True firs

Tree mortality from fir engraver beetle attacks was detected on 2,820 acres of susceptible host type in 1996 compared to 2,685 acres in 1995. Mortality on Federal lands in Arizona occurred on the Apache-Sitgreaves National Forests (670 acres), Coconino National Forest (20 acres), Kaibab National Forest (1,480 acres), Grand Canyon National Park (160 acres), and the Navajo Indian Reservation (50 acres), and in New Mexico on the Carson National Forest (10 acres), Santa Fe National Forest (45 acres), Gila National Forest (80 acres), Lincoln National Forest (165 acres), and the Mescalero Apache Indian Reservation (375 acres).

Western Spruce Budworm

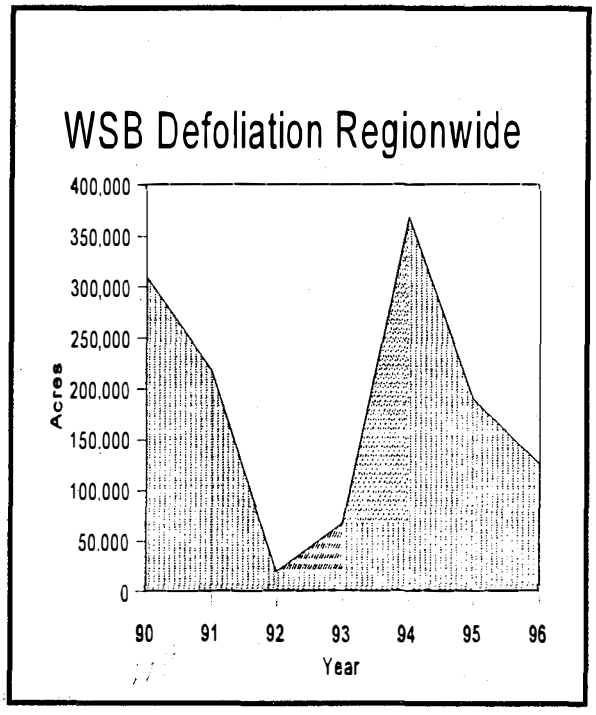
Choristoneura occidentalis

Hosts: True firs, Douglas-fir, Spruce

Western spruce budworm defoliation decreased Regionwide from 190,855 acres in 1995 to 126,985 acres in 1996. In Arizona, defoliated acres decreased from 7,065 acres in 1995 to 425 acres in 1996. This defoliation occurred on the Kaibab National Forest (425 acres). In New Mexico,

defoliation decreased from 183,790 acres in 1995 to 126,560 acres in 1996. On Federal lands, defoliation occurred on the Carson National Forest (63,820 acres), Gila National Forest (240 acres), Lincoln National Forest (40 acres), Santa Fe National Forest (20,230 acres), Santa Clara Pueblo Indian Reservation (280 acres), and the Navajo Indian Reservation (2,645 acres).

Defoliation on non-industrial State and private lands in northern New Mexico totaled 39,305 acres of susceptible mixed conifer host type. Heaviest defoliation occurred in Taos and Colfax Counties. Defoliation also occurred in Catron, Cibola, Mora, Rio Arriba, and Sandoval Counties.



Pinyon Pine Needle Scale

Matsucoccus acalyptus

Host: Pinyon pine

Pinyon pine defoliation on Federal lands declined to 6,600 acres in 1996 from 50,400 acres in 1995. This defoliation, caused by pinyon pine needle scale, occurred in the Burro Mountains on the Silver City Ranger District, Gila National Forest. Several large areas of pinyon needle scale defoliation (acres unknown) were also detected through ground surveys on the Magdalena and Mountainair Ranger Districts, Cibola NF and Nambe and Pojoaque Pueblo tribal lands.

Damage to landscape pinyons on State and private lands was common statewide in New Mexico. Woodland outbreaks of these scale insects were reported in: Lincoln County near the Capitan Mountains south of Capitan; south of Willard; east of El Rito; south of Corona; and east of Silver City.

On State and private lands in Arizona, defoliation by pinyon needle scale was again encountered east of Springerville.

Ponderosa Pine Needle Miner

Coleotechnites ponderosae

Host: Ponderosa pine

Ponderosa pine needle miner populations rose dramatically on State and private lands in New Mexico, discoloring trees on over 27,000 acres in the foothills of the Sangre de Cristo Mountains in San Miguel and Mora counties. The outbreak covered most of the ponderosa pine forest from Sapello west to Rociada and north to Mora. Significant discoloration was also reported south of Las Vegas, New Mexico in the Mineral Hill and San Geronimo areas, the same region where over 50,000 acres of needle miner defoliation was observed in 1989. In addition, some ponderosa pine needle miner activity was detected in Sandoval county near the Baca location (330 acres) and in ornamental trees in Los Alamos (no estimate).

Douglas-fir Tussock Moth

Orgyia pseudotsugata

Hosts: Douglas-fir, True firs, Spruce

Douglas-fir tussock moth defoliation was down in White Rock and Los Alamos, but increased in Santa Fe and Espanola, New Mexico. This insect remains primarily an urban problem in northern New Mexico. It is responsible for occasional defoliation of ornamental spruce, fir, and Douglas-fir in Cedar Crest, Raton, Glorietta, Pecos, and Ruidoso. There were no infestations detected on National Forest lands in 1996.

Pine Tip Moth

Rhyaciona spp.
Hosts: Pines

Landscape pines, particularly ponderosa pine, continue to be severely damaged by several tip moth species of the genus *Rhyaciona*. The Nantucket and western pine tip moths appear to be causing the most severe injury to ornamental pines. Pine tip moth damage continued to occur in both Albuquerque and Santa Fe, New Mexico.

Twig Beetle

Pityophthorus spp.
Hosts: Pines

Early season drought conditions in Arizona and New Mexico have contributed to significant forest and woodland outbreaks of twig beetles. In Arizona, pinyon twig beetle flagging continues to be found in the Pinyon Pine Estates area of the Hualapai Mountains southeast of Kingman. In New Mexico, the lower elevation pinyon pine forests have been hit hard by these tiny insects and landscape damage caused concern in the urban-rural interface near Santa Fe, Placitas, Ruidoso, and Albuquerque's east mountain areas. Twig beetle damage has been detected and reported from nearly all communities statewide.

Pinyon Pine Tip Moth

Diorytria albovittella
Hosts: Pinyon pines

Pinyon pine tip moth damage was again widespread on private lands in Santa Fe and surrounding areas, but was still down from the outbreak of 1994.

Bull Pine Sawflies

Zadiprion townsendii
Hosts: Ponderosa pine

Winter feeding populations of bull pine sawflies, *Zadiprion townsendii*, decreased from last year's outbreak levels in several chronically infested areas in Santa Fe, New Mexico. These insects were also reported causing minor defoliation in Cedar Crest and near Mountainair, New Mexico.

Pinyon Sawfly

Zadiprion rohwerii
Host: Pinyon pine

Navajo Tribal Forestry professionals detected 3,000 acres of pinyon sawfly defoliation on the reservation near Canyon de Chelly. All size classes of pinyon pine were affected. Defoliation ranged from 30 percent to greater than 90 percent. During aerial surveys conducted by an entomologist, with the Arizona Zone of Entomology and Pathology, 600 acres of the defoliation were detected from the air. This was probably the most heavily defoliated area within the 3,000 acres. Dr. Michael Wagner of Northern Arizona University identified the sawfly as being *Zadiprion rohwerii*. This was an unusual amount of defoliation which is not expected to occur in 1997, since the outbreak was probably related to the mild winter temperatures of 1995-1996 and colder temperatures have already returned during the winter of 1996-1997. The staff of the Arizona Zone will continue to work with Navajo Tribal Forestry to monitor this insect population.

Aspen Defoliation:

Large Aspen Tortrix
Choristoneura conflictana

Western Tent Caterpillar
Malacosoma californicum

Marssonina Leaf Blight
Marssonina populi

Hosts: Aspen

Aspen defoliation caused by this complex of insects, diseases, and abiotic factors increased Regionwide from 14,240 acres in 1995 to 35,650 acres in 1996. Defoliation on Federal lands in Arizona included the Apache-Sitgreaves National Forests (1,735 acres), Coconino National Forest (5,300 acres), Coronado National Forest (10 acres), Kaibab National Forest (2,595 acres), Tonto National Forest (40 acres), Grand Canyon National Park (310 acres), and Navajo Indian Reservation (90 acres). In New Mexico, defoliation occurred on the Carson National Forest (10,185 acres), Cibola National Forest (2,080 acres), Lincoln National Forest (960 acres), Santa Fe National Forest (5,550 acres), Santa Clara Pueblo Indian Reservation (120 acres), and the Mescalero Apache Indian Reservation (280 acres). In

addition, approximately 6,395 acres of aspen defoliation were reported on State and private lands in Colfax, Rio Arriba, Cibola, Sandoval, and Taos counties.

Spruce Aphid

Elatobium abietinum (Walker)

Host: Spruce

The spruce aphid, *Elatobium abietinum*, was first reported, to our knowledge, in the Southwest in late 1988 in the White Mountains of Arizona. At that time, approximately 100 acres of Engelmann spruce, *Picea engelmanii*, were defoliated. Later that same winter (1989), insects and defoliation were also observed on ornamental spruce in Santa Fe, New Mexico.

In the winter of 1989-90, defoliation occurred again at Fort Apache and was reported later that year by local foresters. They noted that defoliation of Engelmann spruce was widespread throughout the lower elevation range of this species and estimated that up to 100,000 acres might be affected. The affected area was visited in the summer of 1990. While no aphids were found, defoliation was observed along with some discoloration, presumed to be caused by aphid feeding on live needles on spruce in the area. Defoliation, while noticeable from the ground, was not detected from low flying aircraft during the annual aerial detection survey that summer after the new foliage had expanded.

In 1990 and 1991, low populations and light defoliation were observed in Santa Fe, New Mexico. No tree mortality was reported in any of these cases and defoliation was reported to be heaviest on understory trees.

The aphid then went undetected until the winter of 1995-1996, which was very dry and mild, a condition reported to favor outbreak development. At that time, populations and defoliation increased to spectacular levels in the White Mountains, Arizona. Defoliation was observed both on the Fort Apache Indian Reservation and on adjacent Apache-Sitgreaves National Forests land. About 10,782 affected acres were detected during aerial survey, however the actual acreage was probably greater since light defoliation levels are difficult to see from the air. Some mortality has been reported from the Reservation. All size classes of spruce were affected, including large overstory trees. Defoliation seems worse in the lower elevation ranges where Engelmann spruce occurs mixed with Douglas-fir, white fir and ponderosa pine. In December of 1996, specimens were collected from both Engelmann spruce and blue spruce, *Picea pungens*, and sent to the USDA Systematic Entomology Lab for determination. The identification of *Elatobium abietinum* was confirmed by Gary Miller. Interestingly, only a few aphids and no defoliation were observed on blue spruce, a host which can be heavily defoliated in ornamental situations. It is unclear at this time if the insect is exotic or indigenous to the area. It is also unclear whether the recent discovery of the insect and the more extensive defoliation is just associated with recent unusual weather events (severe drought and warm winter conditions) or reflective of a developing problem. Meanwhile, foresters on the Ft. Apache Indian Reservation are becoming increasingly concerned about potential effects of the organism.

European Gypsy Moth

Lymantria dispar

Various hardwoods

Two adult male gypsy moths were captured in pheromone traps in New Mexico in 1996. These moths were captured in a campground on private land in Tucumcari, Quay County.

Unknown Geometrid Defoliation

Lepidoptera: Geometriidae

Hosts: Spruce, fir

A few hundred acres of defoliation were detected in the spruce-fir type in the Capitan Mountains of New Mexico. A ground check found that both Engelmann spruce and corkbark fir were affected. An unidentified looper (*Lepidoptera: Geometriidae*) appeared to have caused at least some of the damage. In addition, several corkbark firs in the area had recently been attacked by the western balsam bark beetle.

Miscellaneous Insects

About 2,270 acres of gambel oak were defoliated in northern New Mexico, most notably in the Chama area and Sargents Wildlife Refuge. Larvae from an unidentified **underwing moth** (Noctuidae) are likely the cause of this defoliation.

Black pine needle scale, *Noculaspis californica,* was identified for the first time in New Mexico. It was found on ornamental ponderosa and Austrian pines in Albuquerque and Farmington.

Juniper twig pruners and twig girdlers caused extensive flagging of one-seeded junipers in the foothills of the Sandias and Mt. Taylor, New Mexico, and in the Hualapai mountains, Arizona.

Fall web worm defoliation, *Hyphantric cunea,* was common in landscape and lower elevation riparian hardwoods, especially elms and cottonwoods.

Large populations of **pine aphids** (*Cinara* spp.) produced an unusual "icing" symptom (hardened, white sap) on ponderosa pine seedlings and saplings in the Payson and Prescott areas. This is believed to be associated with drought and mild winter conditions.

Scattered **pinyon shoot borer** ***(Dioryctria albovittella)*** activity was observed in the Red Lake area north of Williams, Arizona.

Spider mite (*Oligonychus* spp.) infestations were very widespread, particularly on juniper species in the Prescott, Payson and Sedona areas of Arizona. Other species affected include Arizona cypress, Douglas-fir and assorted landscape plants.

Status of Diseases

Annosus Root Disease

Heterobasidion annosum

Hosts:T rue firs, ponderosa pine

Root diseases and their associated pests are responsible for about one-third of the conifer mortality Regionwide. *Heterobasidion annosum* accounts for about 20 percent of this mortality. During surveys conducted on the North Kaibab Ranger District, *H. annosum* was found in approximately one percent of the standing live trees.

Armillaria Root Disease

Armillaria spp.

Hosts: Douglas-fir, ponderosa pine, true firs, spruce

Armillaria spp. account for about 80 percent of root disease mortality across the Region. A greater percentage of the mixed conifer and spruce-fir forests are infected compared to ponderosa pine type. We are working with some district personnel to determine the occurrence and effects of Armillaria and other root diseases in Southwest forests. During surveys conducted on the North Kaibab Ranger District, Armillaria was found in approximately 30% percentof the standing live trees.

Black Stain Root Disease

Leptographium wageneri varieties

Hosts: Pinyon pine, Douglas-fir

Both *Leptographium wageneri* var. *wagneri,* which infects pinyon, and *L. wagneri* var. *pseudotsugae,* which infects Douglas-fir, are rare in the Southwestern Region. The former is confined to two isolated areas in northern New Mexico, and the latter has been observed only in sites in south-central New Mexico.

Ponderosa Pine Needle Cast

Lophodermella cerina

Hosts: Ponderosa pine

Ponderosa pine needle cast was detected on 2,200 acres of host type on Federal lands in 1996 compared to 10,080 acres in 1995. All of the diseased acres occurred on the Reserve Ranger District, Gila National Forest. Needle cast was not detected on ponderosa pine in Arizona in 1995 or 1996.

Sixty acres of ponderosa pine needle cast were detected on private lands on Laguna Salada Mesa in Mora County near the Colfax County line.

Dwarf Mistletoes

Arceuthobium spp

Hosts: pines, Douglas-fir, spruce, true firs

Dwarf mistletoes are the most significant disease-causing organisms in the Southwestern Region. Over one million acres of National Forest commercial timberlands in each state have some level of dwarf mistletoe infection. Several hundred thousand additional infected acres occur in noncommercial and reserved areas, woodlands, and other public and private forest lands. There is some evidence that the incidence of dwarf mistletoe on ponderosa pine has increased in recent decades. This increase is likely a result of fire suppression (fire being the primary natural control agent) and selective cutting.

White Pine Blister Rust

Cronartium ribicola

Hosts: Southwestern white pine

White pine blister rust occurs throughout most of the range of southwestern white pine (*Pinus strobiformis*) in the Sacramento Mountains and adjoining White Mountains, and has also been found in the Capitan Mountains of southern New Mexico. Roughly one-half million acres are affected. This disease has not been found in Arizona.

Comandra Blister Rust

Cronartium comandrae

Hosts: pines

Comandra blister rust infections continue to cause flagging or dieback of branches of the non-native Eldarica pine in the Prescott, Sedona and Payson areas. In August, this disease was identified on seedlings and saplings of ponderosa pine in the Oak Knoll Subdivision south of Prescott. This disease is rare on its native pine host but is often seen on *Comandra pallida,* its alternate native host.

Abiotic Damage

Drought

Hosts: All species

Drought damage was detected on 61,130 acres of Federal lands in Arizona in 1996. Most tree species were affected with symptoms ranging from yellowed or dried foliage to foliage loss. The following areas had acreages recorded as sustaining drought damage: Apache-Sitgreaves National Forests (310 acres), Coconino National Forest (4,980 acres), Coronado National Forest (3,065 acres), Grand Canyon National Park (700 acres), Kaibab National Forest (24,615 acres), Tonto National Forest (270 acres), and the Hualapai Indian Reservation (27,190 acres).

One of the most noticeable effects of the drought was observed in the native evergreen oaks. Normally, these oaks replace their leaves in early spring. However, in 1996, they dropped these new leaves and remained bare until the advent of the rainy season in early July.

Drought stress was also the probable cause of extensive discoloration and mortality of branches of Arizona cypress north of Sunflower along Slate Creek. This symptom was also observed on individual trees in the Prescott area.

Other Entomology and Pathology Activities in 1996

Prescribed Fire and Dwarf Mistletoe

We have been monitoring the effects of prescribed fire on dwarf mistletoe infection levels on three recent burns on the Santa Fe National Forest.

For the "Road 145" fire on the Espanola Ranger District and the "Stable Mesa" fire on the Jemez District, we set up several rectangular plots prior to burning, sampling a combined total of about 900 ponderosa pine trees. We were able to monitor the effects of another prescribed fire on the Espanola District using an already established "Pest Trend Impact Plot," providing data on an additional 160 trees.

The Road 145 fire took place in October 1995 under fairly dry conditions, resulting in an average crown scorch of about 50 percent. The total number of mistletoe infections was greatly reduced and in at least 15 percent of the surviving infected trees, it appeared that all of the infected branches had been killed. Unfortunately, conditions during the Stable Mesa Fire, in late August 1996, were such that little crown scorch occurred on our plots. The other fire on the Espanola District, in March 1996, resulted in crown scorch averaging about 70 percent. Over 25 percent of the surviving trees appeared to have been completely sanitized of infected branches, although many of these trees may die within the next few years.

We will continue to monitor the scorched plots in order to follow mortality over time and to better quantify the effect on mistletoe levels. We are also planning to monitor additional fires in the future. Along with its many other potential benefits, prescribed fire shows promise as a tool for management of dwarf mistletoe.

For more information concerning this project, please contact Dave Conklin of the New Mexico Zone office.

Training

The Arizona and New Mexico Zone offices of the Southwestern Region offer training to personnel from the USDA Forest Service, USDI Bureau of Indian Affairs and National Park Service, as well as other interested Federal and State agencies and Tribal resource management agencies on a variety of subjects related to forest insect and disease management. Three types of training are offered.

The first type of workshop is aimed at training recreation managers and their staffs the basics of hazard tree detection and management as well as insect and disease recognition. A second workshop entitled "Identification, Effects and Management of Forest Insects and Diseases", is for resource specialists who participate on interdisciplinary teams where forest insects and diseases are a management concern. The third type of training we offer is an informal session on forest insect and disease identification intended for field-going personnel including markers, stand examiners, etc. This session is held upon request for 2 or more people. Contact your local insect and disease specialist for more information about these sessions.

Development of Cavity Nesting Habitat

In the fall of 1996, Catherine Parks, pathologist, Pacific Northwest Research Station, gave a demonstration on the inoculation of a stem decay fungus, *Dichomitus squalens* or Red Rot, into live ponderosa pine trees. She also supplied inoculum for infecting about 100 more trees for 2 projects, one on the Coconino National Forest and one on the Kaibab National Forest. The decay fungus is being used for the creation of cavity nesting habitat in live trees. Mary Lou Fairweather helped with the coordination and implementation of these two projects, and will continue to help with monitoring the results. Contact Mary Lou at the Arizona Zone office if you would like more information about these projects.

Wood Import Pest Risk Assessment and Mitigation Evaluation Team

The Wood Import Pest Risk Assessment and Mitigation Team (WIPRAMET), led by Borys Tkacz, Arizona Zone Leader, is working on a pest risk assessment for the importation of *Pinus* and *Abies* logs from Mexico. A delegation of WIPRAMET members and an Animal and Plant Health Inspection Service (APHIS) representative traveled to Mexico during July 14-26, 1996 to meet with local agricultural, quarantine, and forestry officials, entomologists, pathologists and forest industry representatives to gather information on the proposed importation. The team also toured harvest areas, inspected processing plants and ports, and viewed pest problems in forests throughout Mexico. A final pest risk assessment will be printed during 1997.

Douglas-fir Tussock Moth Early Warning Detection System

Since 1992, an early warning system to detect incipient outbreaks of the Douglas-fir tussock moth has been in operation in Arizona. The Douglas-fir tussock moth, *Orgyia pseudotsugata,* occurs periodically in some mixed conifer forests in the southwest. In Arizona, there are two known historic outbreak areas—the Pinal Mountains and the Sierra Ancha Mountains—near Globe on the Tonto National Forest. The insect has also been trapped in many other locations throughout the state. During outbreaks, defoliation of white fir and Douglas-fir can be spectacular and can result in both top-killing and tree mortality. This insect is very difficult to detect except during outbreaks which can develop rapidly and with little notice. We are also interested in monitoring this insect from a long-term perspective since the mixed conifer type is expanding in the Region. We believe that since many of these areas are relatively dry, they may be quite susceptible to tussock moth in the future.

To assist with monitoring of this insect, an early warning system was developed in the 1970's and is now used throughout much of the intermountain west. This system employs traps baited with a synthetic version of the female moth's sex attractant or pheromone. Traps are placed in groups of 5, spaced about 75 feet apart. An average catch of 40 moths per trap indicates that visible defoliation may be expected the following season.

Our program began in 1992 with traps placed in three general locations in the state—the Mogollon Rim near Payson, Pinal Mountains and Sierra Ancha Mountains. Since 1994, the Arizona State Land Department has also participated in this effort placing traps in the vicinity of Pinetop, Greer, and Alpine. In 1995, the Safford Ranger District became interested following discovery of a small population of the moth on the north slope of West Peak in the Pinaleno mountains. They are now assisting us by maintaining a plot in that area.

If you would like more information on this program, please contact Jill Wilson, entomologist, Arizona Zone Office.

Mountain Pine Beetle Susceptibility/Risk Rating in Southwestern Ponderosa Pine

This multi-region project is funded through the Forest Health Technology Development Program. It was funded beginning in 1995. The objective of the project is to determine significant factors affecting stand and landscape level susceptibility and risk to mountain pine beetle in southwestern ponderosa pine. This information will then be incorporated into an easy to use, flexible computer decision support system that will provide managers with a landscape description of susceptibility and risk. For more information on this project, contact Jill Wilson, Arizona Zone or Jesse Logan, Intermountain Station, Logan Utah.

Site and Stand Factors Associated with the Occurrence of Roundheaded Pine Beetle Outbreaks in Ponderosa Pine

The roundheaded pine beetle, *Dendroctonus adjunctus* (RPB), is one of the most important bark beetles associated with ponderosa pine in southern New Mexico and Arizona. RPB outbreaks have been ongoing in both the Sacramento and Pinaleno mountains, causing widespread tree mortality. No attempt has been made to quantify and model site and stand conditions conducive to infestations. The objective of this study, a cooperative effort involving the Rocky Mountain Forest and Range Experiment Station, Southwestern Region, Lincoln and Coronado National Forests, is to model probability of infestation occurrence during the early stages of an outbreak based on site, tree, or stand conditions. This information will be used to build a stand rating system for this insect in the Southwest. For more information on this project, contact Jill Wilson, Arizona Zone, or Jose Negron, Rocky Mountain Station, Fort Collins.

Web Site

The Arizona and New Mexico Zones launched their web site this year. This site provides a public forum for past and present reporting of conditions, insect and disease biology, training opportunities, and mission statement. It can be accessed by most web browsers at: **http://www.for.nau.edu/usfs/r3_fpm.**

Our site is linked to the USDA Forest Service, Region 3 homepage and the Washington Office Forest Health homepage.

Biological Evaluations And Functional Assistance Letters

Through biological evaluations and functional assistance letters, our staff provides information to affected land management agencies on new or existing insect and disease outbreaks or infestations. In biological evaluations and letters, the specialist reports on the current status and expected population trends of the insect or disease of concern, describes resource and ecological effects of insect or disease activity, and discusses alternatives for management.

The biological evaluations and functional assistance letters written in 1996 by the staff members of the Arizona and New Mexico Zone offices are listed below.

Arizona Zone

1. Comments on Blue Ridge Matrix for Lakeside Ranger District. 2/96.
2. Review of Draft Research Themes for RWU-2. 2/96.
3. Forest Health and Insect Disease Reading List for Kaibab Work Group. 3/96
4. Functional Assistance on Insects and Diseases in the Little Analysis Area (AA). 4/96.
5. Final Report for USFS PO 43-8371-2-0887 Concerning Evaluation of Slash Management Practices for Reduction of *Ips spp.* Brood Production in Ponderosa Pine. 4/96.
6. Letter to BIA regarding possible funding for reducing mistletoe in mesquite on the Fort Mohave Reservation. 4/96.
7. Special use permit application to conduct research on grape phylloxera on the Bradshaw Ranger District. 4/96.
8. Evaluation of Effects of Alternatives for the Mint 10K, Mormon Lake Ranger District, Coconino National Forest. 4/96.
9. Wood Import Pest Risk Assessment and Mitigation Evaluation Team: Mexico Pest Risk Assessment Work Plan. 5/96.
10. Functional assistance to the Hualapai Reservation. 5/96.
11. Biological evaluation of bark beetle risk associated with two prescribed fires on the Peaks Ranger District, Coconino National Forest. 5/96.
12. Functional assistance to Chevelon Ranger District, Apache-Sitgreaves National Forest, Concerning Pinyon *Ips*. 5/96.
13. Update on Mexican Log Import Risk Assessment. 6/96.
14. Functional assistance to Tonto National Monument. 6/96.
15. Ponderosa Pine Mortality at Fool Hollow Recreation Area and Lakeside Campground. 6/96.
16. Review of the Plant Health Risk Assessment for Pine Railway Ties of Pinus spp. from Mexico prepared by Plant Health Risk Unit, Agriculture Canada. 6/96.
17. Dwarf Mistletoe and Alternative #6 in the Little Analysis Area. 8/96.
18. Preliminary Evaluation of Hazard Tree Conditions at the Snowbowl Ski Area. 8/96.
19. Evaluation of Proposed Dwarf Mistletoe Suppression Projects in the East McDonald and Dry Lake Areas of the San Carlos Reservation. 8/96.
20. Functional assistance to Peaks Ranger District concerning Bark Beetle risk associated with the Side and Slate Fires. 8/96.
21. Functional assistance to the North Kaibab Ranger District concerning Bark Beetle Risk associated with the Bridgers Knoll Complex Fire and effects of fire on Ponderosa Pine survival. 8/96.
22. Monitoring bark beetle activity associated with the Bridgers Knoll Fire. 9/96.
23. Review of Draft Mexican Log PRA. 10/96.
24. Evaluation of the population of pinyon sawfly, *Zadiprion rohweri*, on the Navajo Indian Reservation near Canyon de Chelly. 10/96.
25. Functional assistance to the Blue Ridge Ecosystem Analysis concerning Bark Beetle susceptibility rating systems. 10/96.
26. Biological Evaluation of Several Campgrounds on the Beaver Creek Ranger District. 10/96.

27. Functional assistance to the Peaks Ranger District concerning Bark Beetle Risk associated with the Horseshoe and Hochderffer Fires within the Kendrick, Saddle and Toe salvage areas. 10/96.
28. Functional assistance to the Proposed Rancho Alegre Salvage Sale. 11/96.

New Mexico Zone

1. Hazard Tree Evaluations at Recreation Sites on the Mt. Taylor RD, Cibola NF. 1/96.
2. Potential Forest Health Treatments on Stable Mesa, Jemez RD, Santa Fe NF. 2/96.
3. Hazard Tree Evaluations at Recreation Sites in the Black Kettle National Grasslands. 3/96.
4. Effect of Prescribed Fire on Dwarf Mistletoe, Espanola RD, Santa Fe NF. 4/96.
5. Bark Beetle Damage in the Pie Mesa Timber Sale Area, Zuni Pueblo. 4/96.
6. Hazard Tree Evaluations at Recreation Sites in the Kiowa and Rita Blanca National Grasslands. 4/96.
7. Potential Thinning Project in Corn Canyon, Magdalena RD, Cibola NF. 4/96.
8. White Pine Blister Rust Scouting, Gila NF. 4/96.
9. Recent treatments on the Tres Piedras RD, Carson NF. 5/96.
10. Site visits on the Carson National Forest: Hondo Fire, Borrego Mesa, and Alamo-Dinner Sale Area. 6/96.
11. Evaluation of Proposed Dwarf Mistletoe Control Project on the Picuris Pueblo. 7/96.
12. Proposed Stone Lake Dwarf Mistletoe Control Project, Jicarilla Apache Indian Reservation. 7/96.
13. Monitoring in the Benji Timber Sale Area, El Rito RD, Carson NF. 8/96.
14. Proposed Loco Dwarf Mistletoe Control/Thinning Project, Tres Piedras RD, Carson NF. 8/96.
15. Pinon Needle Scale Damage and Mortality, Magdalena RD, Cibola NF. 8/96.
16. Potential Forest Health Treatment Areas on the Pecos RD, Santa Fe NF. 8/96.
17. Drought-Related Insect Damage on Pinyon and Juniper, Nambe and Pojoaque Pueblos. 9/96.
18. Risk assessment for the Dipping Vat Burn, Jicarilla Apache Indian Reservation. 10/96.

Publications

Anonymous. 1996. Forest Insect and Disease Conditions in the Southwestern Region 1995. USDA Forest Service, Southwestern Region. R-3-96-1. 19p.

Tkacz, B.M., and J.L. Wilson. 1996. Forest Insects and Diseases in the Southwest: A historical Perspective. In: J. Wilson and M. Schultz, ed. Proceedings of the Fourth Combined Western Forest Insect Work Conference and Western International Forest Disease Work Conference. 1994 March 7-10: Albuquerque, NM: 20-26.

Wilson, J.L. 1996. Roundheaded Pine Beetle in the Pinaleno Mountains, Results of a Re-survey of the Riggs Lake Area. USDA Forest Service, Southwestern Region. R-3-96-2. 17p.

Wilson, J.L. and B.M. Tkacz. 1996. Historical perspectives on forest insects and pathogens in the Southwest: Implications for restoration of ponderosa pine and mixed conifer forests. In: W. Covington and P.K. Wagner, ed. Conference on Adaptive Ecosystem Restoration and Management: Restoration of Cordilleran Conifer Landscapes of North America: 1995 June 6-8.

USDA Forest Service. Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-GTR-278: 25-30.